Natural Landmark Site Evaluation – Alaska

1979

SIMPSON SEEPS

National Petroleum Reserve-Alaska

CX-9000-7-0052
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SIMPSON SEEPS

GENERAL BACKGROUND

Evaluator:

Dr. Steven B. Young, Director The Center for Northern Studies, Wolcott, Vt. 05680. (802) 888-4331.

Theme Sources:

Detterman R.Z. 1974. The Arctic Lowland Region Potential Landform and Lifeform Natural Landmarks. Prepared for the Nat. Park Service by the Tundra Biome Center, Univ. of Alaska. 189 pp. (p. 330-333).

Collaborators:

Dr. James C. Walters, Asst. Prof. of Geology, Dept. of Earth Sci., Univ. of Northern Iowa, Cedar Falls, Iowa 50613.
Dr. Charles H. Racine, Senior Research Assoc., Center for Northern Studies, Wolcott, Vt. 05680,

Visits:

An on site visit was made to Simpson Seeps on 10 July, 1977. Helicopter landings were made at three locations within the proposal area.

LOCATION

Alaska, North Slope Borough and National Petroleum Reserve in Alaska. Located on the Arctic Ocean (Beaufort Sea) coast about 80 km southeast of Barrow, Ak. It includes all or portions of the following townships;

T.18N., R.10W., Sections 6 and 7
T.18N., R.11W., Sections 1, 11 , and 12
T.19N., R,10W., Sections 19, 20, 30, and 31
T.19N., R,11W., Sections 24, 25, and 36
T.19N., R,1014., Sections 18, 17, 7, and 6
T.19N., R.11W., Sections 13, 12, and 1.
T.20N., R.11W., Section 36

Lat. and Long. Coordinates: 71° 00' North; 154° 38' West.

USGS Quadrangle Reference: Teshekpuk D-3 and Barrow A
1:63,360 quadrangles

SIZE

Acreage: Approximately 10,040 acres. The Simpson Seeps area proposed here is somewhat larger than Detterman's original Simpson Seep area of 6,900 acres.

BOUNDARIES

The boundaries shown on the enclosed map are essentially the same as those proposed by Detterman in the southern half of the proposal. However the northern part has been enlarged to include an outstanding area of eroding bluffs along the Beaufort Sea Coast.

Description:

Beginning in the SW corner of section 11 in T. 18N., R.11 W., the proposed boundary proceeds east along the south boundary of T.18N., R.11W. sections 11 and 12 and T. 18N., R. 10W., section 7 to the 5-foot depth contour of Smith Bay. The boundary here proceeds north along the 5-foot depth contour to a point in the Beaufort Sea approximately 0.8 mile north of the southeast corner point of T. 20N., R. 11W., section 35. At this point in the Beaufort Sea, the boundary proceeds south along the boundary between section 35 and section 36 of T. 20N., R. 11W. The boundary turns west at the intersection of the section 35/36 line and north boundary of section 11 (T. 18N., R.11W.), travels the length of the north boundary of section 11 whereupon it turns south and proceeds down the west boundary of section 11 to the beginning point at the southwest corner of section 11.

Ownership:

National Petroleum Reserve in Alaska (NPR-A), managed by the U.S. Geological Survey and the Bureau of Land Management.

CORRESPONDENTS

Administrative Officials:

Mr. John Santora, Chief of Operations
Office of National Petroleum Reserve in Alaska
Bureau of Land Management
Fairbanks, Alaska 99701

Mr. George Gryc Division of NPR-A
U.S. Geological Survey
2525 "C" Street
Anchorage, Alaska 99501

LAND USE AND INTEGRITY

Over the past forty years, there has been quite a bit of activity in the Simpson Seeps area associated with petroleum exploration. However, little debris or tundra disturbance has resulted from this activity. A Dew Line site is located just outside the boundary of the landmark to the northwest and has had little or no impact on the area.

THREATS TO THE AREA

The Simpson Seeps area is considered one of the most likely areas of the National Petroleum Reserve in Alaska for petroleum production. Although the area was not scheduled for test drilling in 1977-78, future test and production drilling is possible. While exploration and development would pose a threat to the integrity of the site, it is doubted that the seep area itself would be destroyed.

DESCRIPTION OF NATURAL VALUES

The Simpson Seeps area includes tar seeps as well as a wide variety of typical Arctic coast scenery, including eroding bluffs, ice-rich soil features and patterned ground. Much of the area of the Simpson Seeps landmark is apparently underlain by thick dome shaped ridges of solidified petroleum, which seeps naturally from the ground in several locations. The more active seeps are unvegetated; the surface of the tar is unstable and flows slowly downhill, actually reaching the coast in at least one place. More stable deposits are covered by typical tundra vegetation, which seems to be remarkably aggressive in covering the tar; this situation might provide important information on the ability of various tundra plant species to recolonize areas subject to oil pollution, or to resist damage from oil spills.

The most important feature of the tar seeps is , probably the fact that they appear to contain great quantities of mammal bones. Most of the bones seen during our visit were clearly those of caribou, and most appear to be of relatively recent origin. However, some bone fragments appeared to be deeply saturated with oil, and they may belong to other species. In view of the fact that the locations of the active seeps appear to change over the course of time, and that older seeps become stabilized and vegetated, there is reason to believe that some of the older deposits might contain remains of animals from earlier times.

The coast of the northern part of the Simpson Seeps landmark area is an excellent example of the thawing and slumping shoreline erosion found in a number of locations along the Beaufort Sea coast, and the eroding bluffs here are probably as high as any others found in the general area. The development of ground ice is particularly impressive in this region, resulting in gently rolling raised areas. When the higher areas are undercut by the sea, the resulting cliffs are 20 feet or more high, and show exellent sections of the various ground ice features. Also found in the area are a few thaw ponds and small inlets, as well as developed surface features such as loc-centered and high-centered polygons.

SIGNIFICANCE STATEMENT

The presence of natural oil seeps in an Arctic environment as well as coastal shoreline features make the Simpson Seeps area significant. The presence of animal bones in the tar seeps here suggests possible paleontological significance and a situation analogous to that of the famous La Brea tar pits in California. These have proven to be one of the most important sites for reconstructing the Pleistocene mammalian fauna of the area, and for which a major element of the Pleistocene mammal fauna has been named. Simpson Seeps then has the intriguing possibility of providing much insight into the past fauna of Arctic Alaska. However, there is no way this hypothesis could be tested without mounting an excavation project of considerable magnitude, one which would inevitably create disturbance to the site. In our opinion this type of research in the area would be justified, at least in terms of a pilot project, whether the site is afforded Landmark status or not. The coastal portion of the site contains excellent examples of shore erosion of ice-rich sediments, with many exposures of ice wedges.

PUBLICITY SENSITIVITY

This area should not be widely publicized since many visitors might remove the bones found in the oil seeps.

RECOMMENDATION

In our opinion this site appears to be nationally significant, and we recommend that it be designated a natural landmark.

SIGNATURES

SB Young

Steven B. Young

28 Oct 1979

Natural Landmark Brief

1. Site: Simpson Seeps, North Slope Borough, Alaska

2. Description: The site which occupies approximately 11,500 acres is potentially an extremely important paleontological site. The site contains many oil seeps some of which have built tar domes 30 to 40 feet high and covering 10 to 20 acres. Oil seeps out of the ground along the permafrost cracks in many places and elsewhere has formed lakes of oil. Although no intensive surveys have been made of the site, the tar dunes are known to contain abundant bones apparently of relatively recent date. However, much of the tundra in the area of the seeps appears to be underlain by solidified, inactive tar domes. These domes may have solidified during the later Quaternary period and may very possibly have preserved the skeletons of native mammals from various times. The site also contains excellent examples of permafrost features including high-center polygons, numerous ice wedges exposed in the sea cliffs, and several oriented lakes.

3. Owner: The site is owned by the federal government and administered by the Bureau of Lane Management as part of the National Petroleum Reserve in Alaska.

4. Proposed by: Robert L. Detterman in the Arctic Lowland Region Theme Study (geological portion).

5. Significance: The combination of natural oil seeps in an Arctic environment presents both geologic and ecologic features of unique national significance. This site has a long history of aboriginal use and modern day interest and has historical ties with the designation of the National Petroleum Reserve in which it lies. The paleontological values of the site, although largely undefined at present, are highly likely to be of national significance analogous to the LaBrea tarpits in California. The research potential, regarding plant adaptations to hydrocarbons, is also high. The coastal portion of the site contains excellent examples of shore erosion of ice-rich sediments, with many exposures of ice wedges.

6. Land use: A DEW line site and associated airstrip lie near the edge of the site. Test drilling and other petroleum exploration activities have been carried out on the site.

7. Dangers to integrity: As part of the National Petroleum Reserve and an area of apparent petroleum potential the area could be subject to additional petroleum related development. Also, excavation of tar pits without tight controls could seriously damage at least portions of the site.

8. Special conditions: None

9. Onsite evaluation by: Dr. Steven B. Young, Director, The Center for Northern Studies, Wolcott, Vermont. Further evaluated by: Dr. Carl Benson, University of Alaska, Fairbanks; Robert Detterman, U.S. Geological Survey, Menlo Park; Dr. Peter Lent, U.S. Fish and Wildlife Service, Anchorage; C. Gil Mull, U.S. Geological Survey, Anchorage; Dr. David Murry, University of Alaska, Fairbanks; Dr. Patrick Webber, University of Colorado, Boulder; and Dr. Steven Young, The Center for Northern Studies, Wolcott, Vermont.

ENCLOSURES

Maps

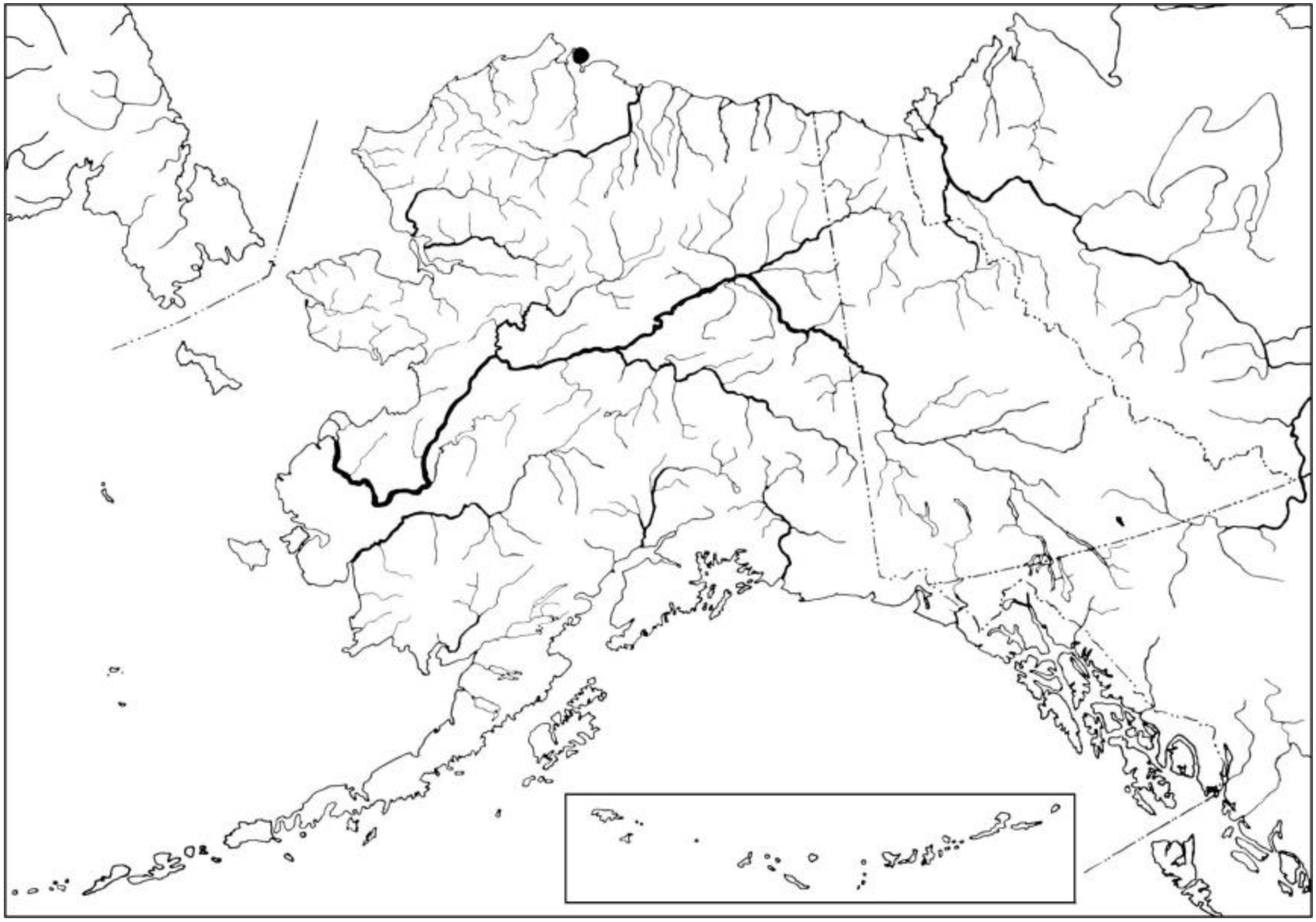
1. Map of Alaska showing location of the Simpson Seeps Landmark in the Arctic Lowlands.
2. Boundaries of the Simpson Seeps Landmark drawn on 1:63,360 scale USGS quadrangle, Teshekpuk (D-3).

Literature Lists:

1. Simpson Seeps

Photographic Illustrations:

1. Seven (7) original color transparencies with original copy.
2. Seven (7) color prints (3½ x 5) with each copy of report, with description and location.



Outline Map of Alaska showing the location of the Simpson Seeps Landmark (indicated by ?)

Bailey, A. M. 1948. Birds of arctic Alaska. Colorado Museum of Nat. Hist., Popular Series No. 8. 317 pp.

Barry, T. W. 1968. Observations on natural mortality and native use of eider ducks along the Beaufort Sea Coast. Can. Field-Nat. 82:140-144.

Barsdate, R. J., Alexander, V., and Benoit, R. E. 1973. Natural oil seeps at Cape Simpson, Alaska: Aquatic effects. Proc. of the Symposium on the Impact of Oil Resource Development on Northern Plant Communities, Occasional Publications on Northern Life, Univ. of Alaska 1:91-95.

Bergquist, H. R. 1966. Micropaleontology of the Mesozoic rocks of northern Alaska. U.S. Geol. Survey Prof. Paper 302D:93-227.

Black, R. F. 1964. Gubik formation of Quaternary age in northern Alaska. U.S. Geol. Survey Prof. Paper 302C:59-91.

Black, R. F., and Barksdale, W. L. 1949. Oriented lakes of northern Alaska. J. Geol. 57:105-118.

Boyd, W. L. 1959. Limnology of selected arctic lakes in relation to water supply problems. Ecology 40:49-54.

Frame, G. W. 1973. Occurrence of birds in the Beaufort Sea, summer 1969. Auk 90:552-563.

Hanna, G. D. 1963. Oil seepages on the arctic coastal plain, Alaska. Occasional Papers of the Calif. Acad. Sci. 38. 18 pp.

Hartwell, A. D. 1973. Classification and relief characteristics of northern Alaska's coastal zone. Arctic 26:244-252.

Hok, J. R. 1969. A reconnaissance of tractor trails and related phenomena on the North Slope of Alaska. U.S. Dept. Interior, Bureau of Land Management. 66 pp.

Holmquist, C. 1967. Turbellaria of northern Alaska and northwestern Canada. Internat. Rev. Gesamten Hydrobiologie 52:123-139.

Imlay, R. W. 1955. Characteristic Jurassic mollusks from northern Alaska. U.S. Geol. Survey Prof. Paper 274D.69-96.

McCown, B. H., Brown, J., and Barsdate, R. J. 1973. Natural oil seeps at Cape Simpson, Alaska: Localized influences on terrestrial habitat. Proc. of the Symposium on the Impact of Oil Resource Development on Northern Life, Univ. of Alaska 1:76-90.

MacCarthy, G. R. 1955. Glacial boulders on the arctic coast of Alaska. Bull. Geol. Soc. Amer. 66:1691.

MacCarthy, G. R. 1958. Glacial boulders on the Arctic coast of Alaska. Arctic 11:71-85.

Morris, R. H. 1950. Heavy mineral zonation in wells of the Barrow, Cape Simpson and Umiat areas. U.S. Geol. Survey open-file report.

Reimnitz, E., and Bruder, K. F. 1972. River discharge into an ice-covered ocean and related sediment dispersal, Beaufort Sea, coast of Alaska. Bull. Geol. Soc. Amer. 83:861-866.

Robinson, F. M. 1959. Test wells, Simpson area, Alaska. U.S. Geol. Survey Prof. Paper 305J:523-568.

Smith, P. S., and Mertie, J. B., Jr. 1930. Geology and mineral resources of northwestern Alaska. U.S. Geol. Survey Bull. 815. 350 pp.

Spetzman, L. A. 1959. Vegetation of the Arctic Slope of Alaska. U.S. Geol. Survey Prof. Paper 302B:19-58.

Steere, W. C. 1978. The Mosses of Arctic Alaska. J. Cramer, Vaduz. 508 pp.

Stefansson, V. 1910. Notes from the arctic. Bull. Amer. Geog. Soc. 42:460-461.

Wiggins, I. L., and Thomas, J. H. 1962. A flora of the Alaskan Arctic Slope. Arctic Inst. North America, Special Publ. 4. 425 pp.

Wilson, W. J., Buck, E. H., Player, G. F., and Dreyer, L. D. 1977. Winter water availability and use conflicts as related to fish and wildlife in arctic Alaska - a synthesis of information. U.S. Fish and Wildlife Service, Biological Services Program FWS/OBS-77/06. 222 pp.

Figure 1. View of one of the more active tar seeps, looking southward. Most of the actual seep is near the right hand side of the picture, with the flow toward the left.

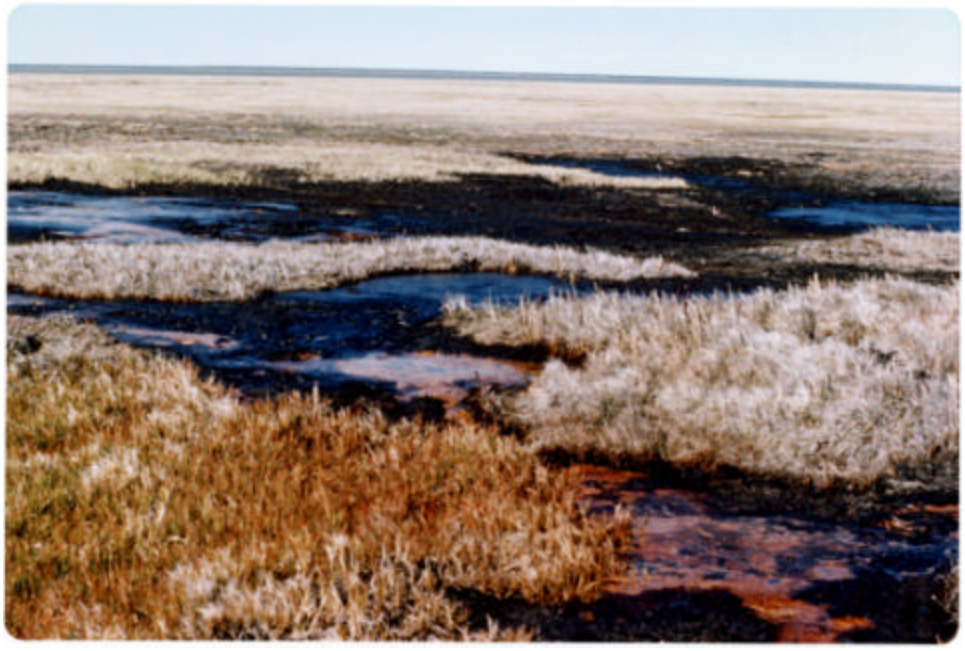


Figure 2. View of a smaller, less active seep. Note that tundra vegetation has actually encroached on the exposed surface of the tar. Domes of solidified tar are apparently mostly vegetated, and appear to underlie a considerable portion of the area.

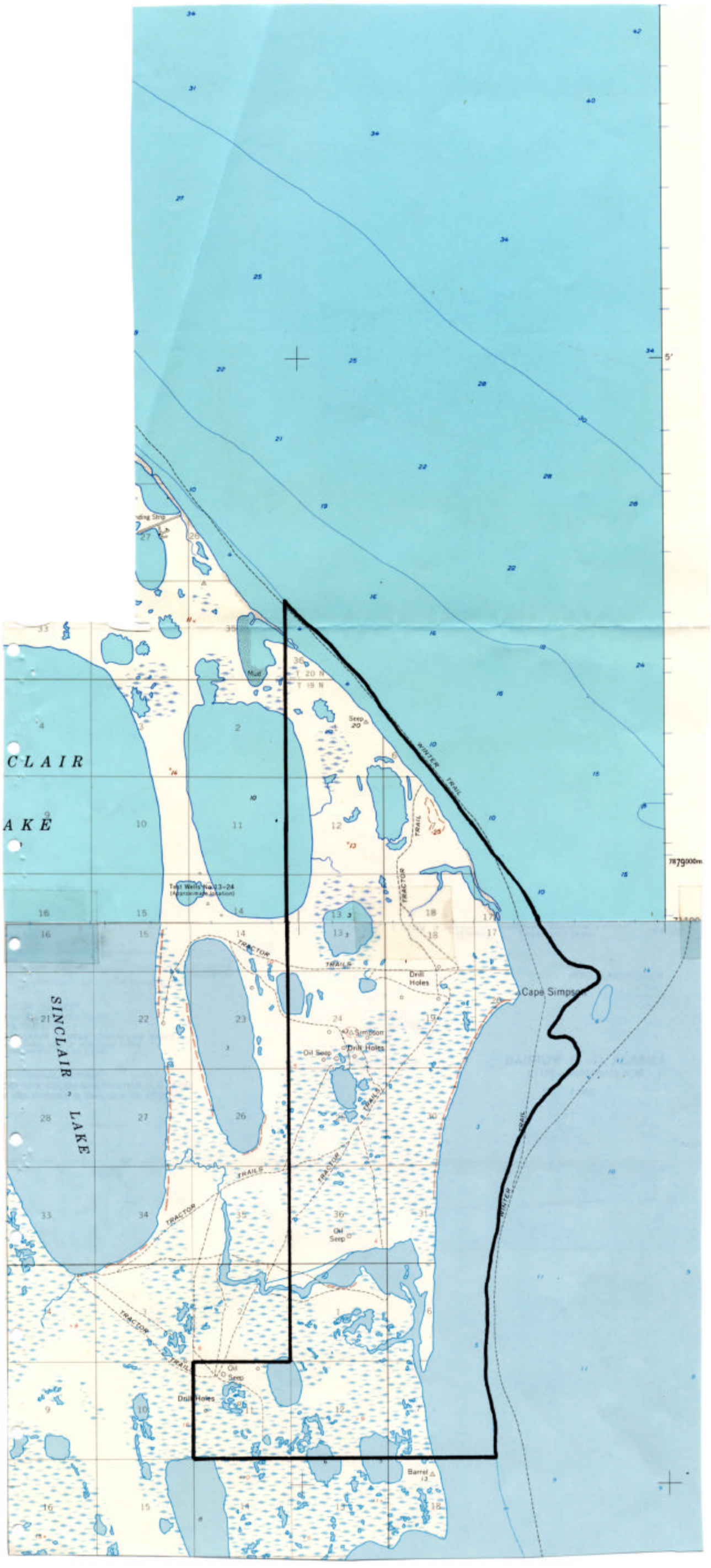
Figure 3. Close view of an active tar seep. The view is to the westward, so that the direction of flow is toward the viewer. Standing water covers the more level surfaces of the seep. The bright orange color is apparently due to the presence of algae or bacteria.

Figure 4. Animal bones exposed on the surface of the tar seeps. There is much evidence of the recent trapping of caribou in the soft tar, and most of the bones that were easily identified belong to that species. However there is some indication that bones belonging to other species are also contained in the tar deposits.

Figure 5. Exposed ice wedge along the north (Beaufort Sea) coast of the Simpson Seeps area. The actively eroding coastline in this area provides an excellent opportunity to see this characteristic feature of the Arctic Lowland area.

Figure 6. More distant view of the eroding Beaufort Sea coastline, showing the undercutting of the ice-rich Gubik sediments by the action of waves and thawing.

Figure 7. Eroding high-centered polygons near the Beaufort Sea coast of the area. These are apparently formed by the melting out of ice wedges at the periphery. As melting goes deeper, the active erosion shown here takes place.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